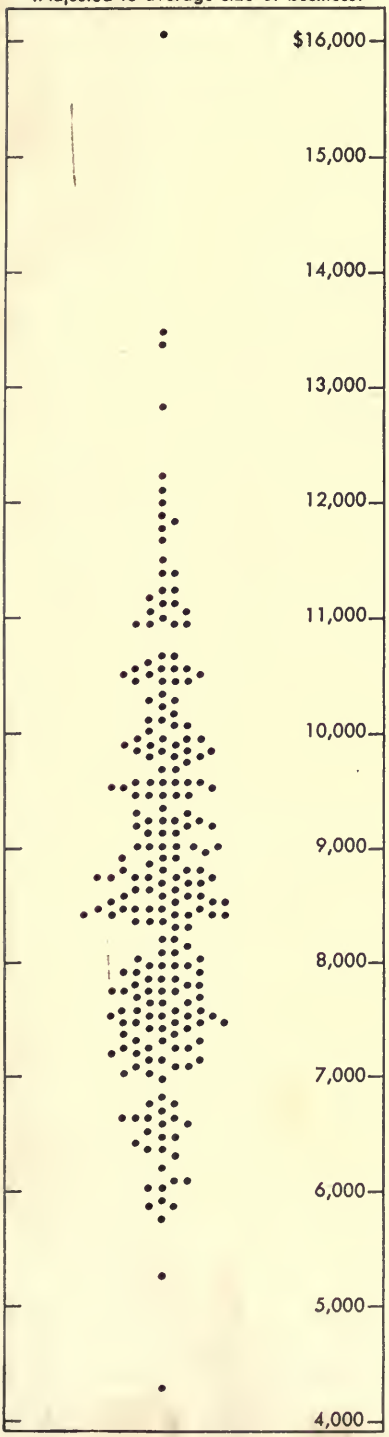
630.7
I ℓ 6b
no.558
cop.8

UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN
AGRICULTURE

630.7
I266
no.558
cop.8

CIRCULATING COPY
AGRICULTURE LIBRARY

AVERAGE ANNUAL NET FARM EARNINGS (1936-1945) ON 240 NORTH-CENTRAL ILLINOIS FARMS
(Adjusted to average size of business)



WHY SOME FARMS EARN SO MUCH MORE THAN OTHERS

By M. L. MOSHER
and V. I. WEST

AGRICULTURE LIBRARY
SEP 26 1990
UNIVERSITY OF ILLINOIS

Bulletin 558

University of Illinois
Agricultural Experiment Station

CONTENTS

HOW THE STUDY WAS MADE 5

EFFICIENCY FACTORS THAT AFFECT NET FARM EARNINGS 8

Yields of Grain Crops 11

Crop System 11

Efficiency in Producing Livestock 14

Amount of Livestock 14

Prices Received 15

Labor Costs 18

Power and Machinery Costs 21

Building and Fencing Costs 23

Cost of Limestone and Fertilizer 25

Well-Balanced Farm Programs Most Profitable 25

VOLUME OF BUSINESS AS RELATED TO NET FARM EARNINGS . . . 28

HOW SOME FARMS INCREASED THEIR EARNINGS MORE THAN OTHERS 30

EXPLANATION OF TERMS USED IN THIS STUDY 34

NOTE ON THE STATISTICAL RESULTS 39

SUMMARY 40

Urbana, Illinois August, 1952

Publications in the Bulletin series report the results of investigations made or sponsored by the Experiment Station

FOREWORD

The study reported in this publication was undertaken to learn the net effect on earnings of each of several factors used in measuring the efficiency of organization and operation of farms and to find the relationships between each factor and each of the other factors. A preliminary study showed that the selected factors were related to farm earnings. It is recognized that it is difficult to isolate the net effects of such complex and related factors. The report may help other research workers to design more complete models for farm-record analysis.

Farmers can use this report as a guide in evaluating the efficiency of their operations, while recognizing that on individual farms the importance of the different factors will vary greatly. The net effect of any one factor may appear small as an average of a large number of farms, but it may have a great deal to do with making earnings high or low on any particular farm.

The authors acknowledge and appreciate the work of the 240 north-central Illinois farmers who during ten consecutive years kept the records on which the study was based and that of the following fieldmen who supervised the record keeping — W. A. Herrington, B. E. King, E. G. Fruin, and M. P. Gehlbach. The assistance of H. C. M. Case, P. E. Johnston, and E. J. Working in planning the study and of many members of the Department of Agricultural Economics for critical reading of the manuscript is acknowledged with appreciation.

THE AUTHORS

WHY SOME FARMS EARN SO MUCH MORE THAN OTHERS

By M. L. Mosher and V. I. West[1]

ONE FARMER IN FIVE in the center of the corn belt earns enough more than the lowest-earning of the other four similar farmers to pay for his farm in fifteen to twenty years from the difference in earnings. One farmer is very successful, gives his family a good living, and pays for his farm in twenty to thirty years, while a neighbor with a farm of the same size on equally good land may have trouble making ends meet or may even lose a farm that he had inherited free from debt.

Farm records have always shown wide differences in earnings among similar farms. During the seven years 1916-1922, an average difference of $19.17 an acre was found between the one-fifth high-earning farms and the one-fifth low-earning farms in a study in Woodford county. In a later study in Livingston, McLean, Tazewell, and Woodford counties, a similar comparison showed that differences in net earnings varied from $9.30 an acre during the depression years of 1932-1934 to $26.09 during the war and postwar years 1944-1946.

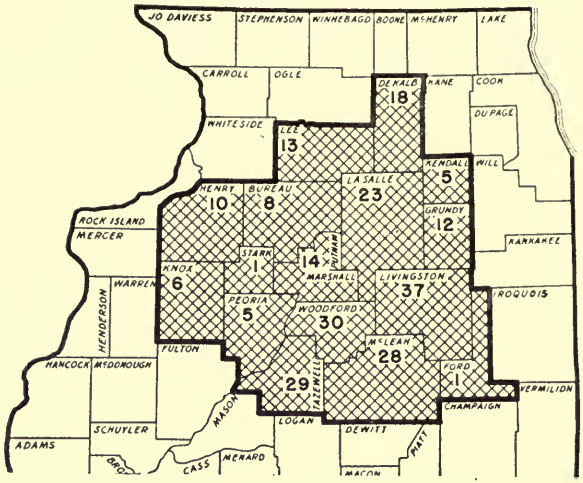
Why do some farmers earn so much more than others who operate similar farms? This study was undertaken to find the answer.

HOW THE STUDY WAS MADE

This study is based on ten-year summaries, 1936 to 1945, of farm-account records kept by 240 cooperators in the Farm-Bureau Farm-Management Service.[2] The records were from farms located in seventeen counties in north-central Illinois (Fig. 1). Records of the total farm business were used in making the study. Less than half the farms were owner-operated. In this regard this group of farms was typical of farms in the area as a whole, where 50 to 60 percent are operated by tenants. Many farmers owned some land and rented additional land.

[1] M. L. Mosher, Professor of Farm Management; and V. I. West, Assistant Professor of Agricultural Economics.

[2] The Farm-Bureau Farm-Management Service is a service for farmers conducted by the University of Illinois Department of Agricultural Economics in cooperation with county farm bureaus. Records kept by cooperating farmers are supervised by fieldmen trained in farm management, who spend all their time with about 200 farmers each. About 80 percent of all costs of the service is from annual fees paid by the cooperating farmers.



Locations of the 240 farms included in this study are shown by the numbers in the counties. (Fig. 1)

The farms as a group were considered to be somewhat above average in native productivity and the efficiency with which they were operated.

Quality of land. The soil on most farms was dark prairie loam. A few farms had a little light timber or sandy soil, and a few farms in the eastern part of the area had dark prairie soils underlain with tight clay subsoils. All farms were on soils recognized as good cornland.

Most of the land was tillable. On 40 percent of the farms, all of the land was tillable, 25 percent of the farms had 90 percent or more of the land tillable, 21 percent had 80 to 90 percent tillable, and 14 percent had less than 80 percent tillable.

Most farms had some sloping land subject to sheet erosion. Some slopes were steep enough to require permanent grass waterways, and a few had to be contour-farmed, strip-cropped, or terraced to avoid serious erosion.

Size. The farms were somewhat larger than others in the same area. They averaged 277 acres for the ten years. The smallest farm averaged 84 acres for the period and the largest 728 acres. According to the 1940 Census, the average size of all farms in the area that were over 70 acres was 200 acres. Compared with all farms in the area, relatively few of the 240 farms averaged less than 180 acres while a much larger proportion were over 260 acres. The fact that the farms

studied were somewhat larger than average, however, does not interfere with the major purpose of the study, which was to learn why some farms earn so much more than other similar farms.

Type of farming. Mixed grain and livestock farming prevails in the area. Fifteen percent of the farms included in the study were classified as grain farms because they fed less than 30 percent of the total crop returns; 36 percent were mixed grain-and-livestock farms, feeding 30 to 60 percent of the crops; and 49 percent were livestock farms, where 60 percent or more of the total crop returns was fed to productive livestock.

Prices. The period 1936-1945 divides naturally into two equal parts: the five prewar years of 1936 to 1940 and the five years 1941-1945, which were dominated by the war. Prices received by Illinois farmers rose from 110 percent of the 1910-1914 level during the first five years to 171 percent during the second five years. Prices paid by U. S. farmers for commodities, interest, taxes, and wages rose from 126 percent of the 1910-1914 level during the prewar years to 156 percent during the war years.

Measurements of earnings. Farm and family earnings averaged $4,300 a year more on the 72 highest-earning farms (30 percent of all 240) than on the 72 farms with lowest earnings (Table 1). "Farm and family earnings" is about the same as "gross profit" as used on the Federal Income Tax Form 1040F. This measure is closely related to *both size and efficiency* of the farm business, as also are the measures "operator's labor and management earnings" and "management earnings." (See page 35 for explanation of these terms.)

Table 1. — Farm Earnings, Size of Farm, and Quality of Land: Averages for 240 North-Central Illinois Farms, 1936-1945

Item	All 240 farms	72 highest-earning farms[a]	96 medium-earning farms[a]	72 lowest-earning farms[a]	Differences between high- and low-earning groups
Total farm and family earnings..	$7 910	$10 150	$7 780	$5 850	$4 300
Net earnings per $100 charged for land, labor, and capital.....	$158	$193	$156	$126	$67
Percent earned on investment...	8.0	10.3	7.8	5.9	4.4
Operator's labor and management earnings.....	$3 970	$6 060	$3 830	$2 060	$4 000
Management earnings.....	$3 200	$5 280	$3 080	$1 290	$3 990
Net earnings per acre.....	$25.30	$32.87	$25.00	$18.13	$14.74
Size of farm, total acres.....	277	281	275	276	5
Percent tillable.....	90	90	90	89	1
Soil-productivity rating.....	2.3	2.3	2.3	2.4	−.1

[a] On the basis of net earnings per $100 charged for land, labor, and capital.

To compare *only the efficiency* with which farms are operated, a measure is needed that is largely independent of the size of the farm and the quality of the land. Two such measures are rate earned on investment and net earnings per $100 charged for land, labor, and capital. "Rate earned on investment," however, considers only the investments in land and capital. "Net earnings per $100 charged for land, labor, and capital" measures the combined inputs of all three factors of production — land, labor, and capital. For that reason it has been selected for use in this study as the measure of the efficiency of the organization and operation of the farms.

Hereafter, unless otherwise stated, a reference to high- or low-earning farms means that the farms have high or low net earnings per $100 charged for land, labor, and capital.

EFFICIENCY FACTORS THAT AFFECT NET FARM EARNINGS

The effects on net farm earnings of ten efficiency factors and two factors relating to volume of business were studied (Tables 2, 3, and 5). Five of the efficiency factors were directly related to gross income and five to farm expenses. The relative importance of these factors, except "percent of normal miscellaneous costs,"[1] and the relationships between them are discussed in the following pages. The two factors relating to volume of business are discussed on pages 28 to 30.[2]

The net effect on net earnings of each of the ten efficiency factors was estimated by a standard procedure called linear regression analysis. The net effect is the amount of change in farm earnings which a unit change in that factor would cause if none of the other factors

[1] More than half of all miscellaneous cost was for taxes for real estate and personal property. Since rate of taxation depends more on location than on organization and operation of farms, and since there appeared to be no significant difference in farm earnings due to miscellaneous cost, it is not discussed further. It was included in Tables 2 and 3 only so that all farm expenses might be considered in evaluating the relative effects of all efficiency factors on net farm earnings.

[2] Many conditions which are more or less outside the control of the farm operator affect the efficiency with which the factors discussed in this publication are carried out. Among them are: (1) age of the operator; (2) education and training of the operator; (3) health of the operator and members of his family; (4) changes in the farm production plan; (5) unusual weather; and (6) unusual insect and disease attacks on both crops and livestock. These conditions, however, affect farm earnings only as they affect the efficiency factors discussed in this study.

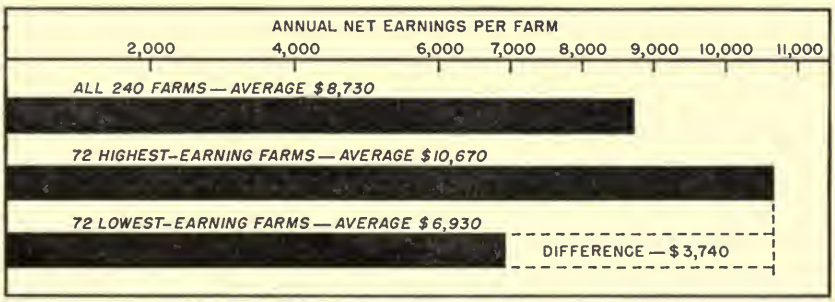
Table 2. — Net Effects of Each of Ten Efficiency Factors on Net Farm Earnings: 240 North-Central Illinois Farms

Efficiency factors considered	Unit of measure of factor used	Net effect of 1 unit of factor on net earnings per $100 charged for land, labor, and capital	Net effect of 1 unit of factor on net earnings per average farm having $5,525 charged for land, labor, and capital
Factors that affect gross income:			
Crop-yield index	1 point	$1.4123	$ 78.03
Crop-system rating	1 point	1.8471	102.05
Livestock-production index	1 point	.8580	47.40
Percent of crop returns fed on farm	1 percent	.0977	5.40
Price index	1 point	1.6891	93.32
Factors that affect farm expenses:			
Percent of normal labor cost	1 percent	−.5673	−31.34
Percent of normal power and machinery cost	1 percent	−.2898	−16.01
Percent of normal building and fence cost	1 percent	−.1300	− 7.18
Limestone and fertilizer cost per tillable acre	1 cent	−.0538	− 2.97
Percent of normal miscellaneous cost*	1 percent	.0713	3.94

* Consisting of: taxes, 55.1 percent; miscellaneous crop expense, 22.7 percent; miscellaneous livestock expense, 13.2 percent; and general farm expense, 9.0 percent.

changed (Table 2). It is, of course, unusual and almost impossible for a given factor to change without producing changes in other factors. For this reason, the discussion on the following pages specifically points out associated relationships of each factor with the other factors.

The estimates of the net effects are subject to error because of chance variations and the way the measures of each factor were computed. The adequacy of these factors as a group may be judged by the percent of the differences in earnings between high- and low-earning farms that is explained by them (Table 3). The amount of error due to chance variation was small.



Net earnings of each of these groups were obtained by applying the average net earnings per $100 charged for the use of land, labor, and capital to the average total charges per farm of all 240 farms. (Fig. 2)

Table 3. — Extent to Which Ten Efficiency Factors Were Responsible for Differences Between Average Net Earnings of 72 High-Earning Farms and 72 Low-Earning Farms

Factors that affect net farm earnings	Averages of measures of factors named		Differences		Percent of total differences
	72 farms with highest earnings	72 farms with lowest earnings	In measure of factor named	In net earnings per farm	
Net earnings per $100 charged for land, labor, and capital	$193.20	$125.50	$67.70	$3,740	....
Factors that affect gross income:					
Crop-yield index	108.6	95.4	13.2	$1,030	27.5
Crop-system rating	71.2	68.9	2.3	$235	6.3
Livestock-production efficiency index	106.3	97.3	9.0	$427	11.4
Percent of crop returns fed on farm	81.2	60.4	20.8	$112	3.0
Price index	101.7	98.3	3.4	$317	8.5
Factors that affect farm expenses:					
Percent of normal labor cost	94.3	106.6	−12.3	$385	10.3
Percent of normal power and machinery cost	87.8	101.9	−14.1	$226	6.0
Percent of normal building and fencing cost	95.1	106.5	−11.4	$82	2.2
Value of limestone and fertilizers used annually per tillable acre	$ .56	$ .41	$ .15	−$45	−1.2
Percent of normal miscellaneous cost[a]	101.3	99.7	1.6	$6	.2
Total located differences in net farm earnings	.....	.....	.....	$2,775	74.2
Differences not accounted for	.....	.....	.....	$965	25.8

[a] Consisting of: taxes, 55.1 percent; miscellaneous crop expense, 22.7 percent; miscellaneous livestock expense, 13.2 percent; and general farm expense, 9.0 percent. Since the rate of taxation depends more on location than on the organization and operation of a farm and since this factor appeared not to be significant, it does not appear in the later tables.

The relative importance of each of the ten efficiency factors is measured by the percent of the difference in earnings between high- and low-earning farms which is accounted for by the difference between the two groups in the average measure of that factor[1] (Tables 2 and 3 and Figs. 2 and 3).

Crop yields, accounting for 27.5 percent of the difference in earnings, were more than twice as important as any one of the other nine factors. Costs on farms with high yields did not average enough higher to offset the increase in yields (Fig. 3).

Efficiency in producing livestock accounted for 11.4 percent of the differences in earnings and was second only to crop yields in importance. *Labor cost* (10.3 percent), *average prices received* (8.5 percent), and the *profitableness of the crop system* (6.3 percent) were next in order. Together these five factors accounted for 64.0 percent of the difference in earnings between high- and low-earning farms. The *other cost factors* and the *amount of livestock* (measured by the value of feed fed as a percent of the total value of all crop returns)

[1] This rather unusual measure of relative importance was chosen because it is easily explained. The measure is closely related to the coefficient of separate determination. For a discussion of the latter measure, see page 498 of *Methods of Correlation Analysis* by Mordecai Ezekiel (second edition).

Table 4. — Average Yields of Grain Crops on Farms Grouped According to the Crop-Yield Index[a]

Crop	72 farms with highest yield indexes	96 farms with medium yield indexes	72 farms with lowest yield indexes	Average of all 240 farms
Crop-yield index	113.9	100.0	89.6	101.4
Corn, bushels per acre	72.2	63.4	57.0	64.1
Oats, bushels per acre	56.5	49.0	43.7	49.7
Wheat, bushels per acre	26.0	23.6	23.8	24.3
Soybeans, bushels per acre	26.1	24.5	21.9	24.2

[a] Average yields were obtained by adding the ten-year average yields of farms in each group and dividing by the number of farms in each group, thus giving equal weight to each farm regardless of the acres of crops grown. Ten-year average yields for each farm were obtained by dividing total production for the ten years by total acres grown.

accounted for 10.2 percent of the difference in earnings. The remaining 25.8 percent could not be accounted for by these factors.

Yields of Grain Crops

Of the total difference of $3,740 in average annual net earnings per farm between the 72 highest-earning farms and the 72 lowest-earning farms, $1,030 (27.5 percent) was accounted for by differences in the yields of grain crops. In addition, some of the $965 not accounted for was probably due to differences in yields of hay, pasture, and other crops. For average yields of corn, oats, wheat, and soybeans on these farms, see Table 4.

The 72 farms having the highest yields of grain crops earned $1,860 more a year than the 72 having the lowest yields. This difference was greater than the difference between the 72 highest and 72 lowest farms for each of the other factors studied (Table 5, column 2).

Of course not all the higher earnings on farms with high yields were due to higher yields (Fig. 3). Part of the difference was associated with (1) better livestock-production efficiency on farms with high yields; (2) higher prices received for products sold; and (3) more livestock. On the other hand, earnings on the farms with high yields tended to be pulled down by (1) high building and fencing costs; (2) high labor costs; (3) high power and machinery costs; (4) less profitable crop systems; and (5) high costs for limestone and fertilizers.

Crop System

Differences in the immediate profitableness of the crop system, as measured by the crop-system rating,[1] accounted for 6.3 percent ($235)

[1] The meaning of "crop-system rating" and the method of calculating it are given on page 36.

Table 5. — Relation of Factors That Affect Farm Earnings to Net Farm Earnings and to Each Other

	Returns per $100 charged for use of land, labor, and capital	Annual net farm earnings based on average size of business	Factors directly affecting gross farm income					Factors directly affecting farm expense			
			Crop-yield index	Crop-system rating	Livestock production efficiency index	Percent of crop returns fed	Price index	Percent of normal labor cost	Percent of normal power and machinery cost	Percent of normal building and fencing cost	Lime and fertilizer cost per tillable acre
	1	2	3	4	5	6	7	8	9	10	11
A. Net earnings for land, labor, and capital											
Average of all 240 farms	**$158.00**	$8 730	101.5	70.1	102.7	67.6	99.9	100.4	94.4	100.0	.49
72 farms with highest earnings	**193.20**	10 670	108.6	71.2	106.3	81.2	101.7	94.3	87.8	95.1	.56
96 farms with medium earnings	**155.80**	8 610	100.7	70.2	104.1	62.7	99.7	100.5	93.8	98.8	.50
72 farms with lowest earnings	**125.50**	6 930	95.4	68.9	97.3	60.4	98.3	106.6	101.9	106.5	.41
Diff. in factors: 72 highest minus 72 lowest	**67.70**	3 740	13.2	2.3	9.0	20.8	3.4	−12.3	−14.1	−11.4	.15
Diff. in net earnings due to diff. in factors	.....	.....	$1 030	$235	$427	$112	$317	$385	$226	$82	−$45
(Factors directly affecting gross farm income)											
B. Crop yields (index)											
72 farms with highest yield indexes	**$174.00**	$9 610	**113.9**	69.4	104.7	82.4	100.3	102.8	97.0	114.3	.58
96 farms with medium yield indexes	**159.20**	8 800	**101.0**	70.5	103.0	66.8	100.6	101.5	94.8	99.9	.50
72 farms with lowest yield indexes	**140.30**	7 750	**89.6**	70.3	100.4	53.7	98.6	96.7	91.2	85.9	.38
Diff. in factors: 72 highest minus 72 lowest	**33.70**	1 860	**24.3**	−.9	4.3	28.7	1.7	6.1	5.8	28.4	.20
Diff. in net earnings due to diff. in factors	.....	.....	**$1 896**	−$92	$204	$155	$159	−$191	−$93	−$204	−$59
C. Crop system (rating)											
72 farms with highest crop-system ratings	**165.40**	9 140	100.1	**74.5**	101.2	57.8	100.3	97.6	93.8	100.1	.49
96 farms with medium crop-system ratings	**156.70**	8 660	100.9	**70.2**	102.3	71.1	99.8	101.2	94.6	97.5	.49
72 farms with lowest crop-system ratings	**152.10**	8 400	103.5	**65.6**	104.7	72.6	99.5	102.3	94.7	103.4	.49
Diff. in factors: 72 highest minus 72 lowest	**13.30**	740	−3.4	**8.9**	−3.5	−14.8	.8	−4.7	−.9	−3.3	0
Diff. in net earnings due to diff. in factors	.....	.....	−$265	**$908**	−$166	−$80	$75	$147	$14	$24	0
D. Livestock-production efficiency (index)											
72 farms with highest efficiency	**167.10**	9 230	103.5	69.7	**116.7**	57.1	98.4	103.1	94.6	103.2	.48
96 farms with medium efficiency	**161.90**	8 940	101.4	70.1	**102.5**	74.0	98.9	97.7	92.7	92.8	.49
72 farms with lowest efficiency	**143.70**	7 940	99.5	70.6	**88.9**	69.4	102.6	101.4	96.5	106.3	.50
Diff. in factors: 72 highest minus 72 lowest	**23.40**	1 290	4.0	−.9	**27.8**	−12.3	−4.2	1.7	−1.9	−3.1	−.02
Diff. in net earnings due to diff. in factors	.....	.....	$312	−$92	**$1 318**	−$66	−$392	−$53	$30	$22	$6
E. Amount of livestock (% of crop returns fed)											
72 farms that fed most feed	**166.00**	9 170	107.3	69.0	99.3	**115.7**	100.7	99.7	94.3	104.3	.60
96 farms that fed medium amounts of feed	**155.00**	8 560	100.0	69.9	102.5	**60.8**	99.7	98.7	94.0	96.7	.48
72 farms that fed least feed	**153.80**	8 500	97.4	71.5	106.4	**28.4**	99.3	103.6	95.0	100.1	.40
Diff. in factors: 72 most minus 72 least	**12.20**	670	10.1	−2.5	−7.1	**87.3**	1.4	−3.9	−.7	4.2	.20
Diff. in net earnings due to diff. in factors	.....	.....	$788	−$255	−$337	**$471**	$131	$122	$11	−$30	−$59
F. Prices received for products sold (index)											
72 farms receiving highest prices	**167.70**	9 270	103.4	70.5	97.6	73.9	**105.9**	101.3	92.2	102.4	.56
96 farms receiving medium prices	**159.10**	8 790	101.2	70.2	102.8	64.4	**99.5**	100.1	94.0	96.4	.48
72 farms receiving lowest prices	**146.70**	8 110	99.9	69.7	107.7	65.5	**94.4**	100.0	97.1	102.4	.44
Diff. in factors: 72 highest minus 72 lowest	**21.00**	1 160	3.5	.8	−10.1	8.4	**11.5**	1.3	−4.9	0	.12
Diff. in net earnings due to diff. in factors	.....	.....	$273	$82	−$479	$45	**$1 073**	−$41	$78	0	−$36

Table 5. — Concluded

	1	2	3	4	5	6	7	8	9	10	11
(Factors directly affecting farm expenses)											
G. Labor cost (percent of normal cost)											
72 farms with lowest labor costs	**$172.60**	$9 540	100.7	71.4	101.6	68.8	99.6	**82.5**	86.8	92.3	.48
96 farms with medium labor costs	**157.40**	8 700	100.9	69.8	102.7	72.5	99.6	**99.0**	93.0	95.3	.47
72 farms with highest labor costs	**144.10**	7 960	103.0	69.2	103.9	59.7	100.5	**120.3**	103.9	114.1	.52
Diff. in factors: 72 lowest minus 72 highest	**28.50**	1 580	−2.3	2.2	−2.3	9.1	−.9	**−37.8**	−17.1	−21.8	−.04
Diff. in net earnings due to diff. in factors	.....	.....	−$179	$225	−$109	$49	−$84	**$1 185**	$274	$157	$12
H. Power and machinery cost (% of normal cost)											
72 farms with lowest power and machinery costs	**171.60**	9 480	100.4	70.1	101.6	68.9	100.4	91.4	**76.4**	86.9	.45
96 farms with medium power and machinery costs	**155.60**	8 600	101.5	70.4	103.1	66.4	99.4	100.8	**93.4**	97.2	.50
72 farms with highest power and machinery costs	**147.40**	8 140	102.5	69.9	103.3	67.8	100.0	109.1	**113.8**	116.9	.52
Diff. in factors: 72 lowest minus 72 highest	**24.20**	1 340	−2.1	.2	−1.7	1.1	.4	−17.7	**−37.4**	−30.0	−.07
Diff. in net earnings due to diff. in factors	.....	.....	−$164	$20	−$81	$6	$37	$555	**$599**	$215	$21
J. Building and fencing cost (% of normal cost)											
72 farms with lowest building and fencing costs	**162.70**	8 990	97.4	70.3	103.8	63.1	99.3	95.1	86.8	**64.3**	.42
96 farms with medium building and fencing costs	**156.20**	8 630	101.3	70.0	102.4	68.8	99.4	100.3	95.2	**94.9**	.48
72 farms with highest building and fencing costs	**155.50**	8 590	105.7	70.1	102.1	70.3	101.0	105.9	100.8	**142.6**	.57
Diff. in factors: 72 lowest minus 72 highest	**7.20**	400	−8.3	.2	1.7	−7.2	−1.7	−10.8	−14.0	**−78.3**	−.15
Diff. in net earnings due to diff. in factors	.....	.....	−$648	$20	$81	−$39	−$159	$338	$224	**$562**	$45
K. Lime and fertilizer costs per tillable acre											
72 farms with highest soil-mineral costs	**164.60**	9 090	106.1	70.1	102.2	80.5	101.5	101.4	96.6	106.3	**.87**
96 farms with medium soil-mineral costs	**155.00**	8 560	100.6	69.5	103.9	68.3	99.6	101.4	95.1	102.7	**.44**
72 farms with lowest soil-mineral costs	**155.20**	8 570	98.0	70.9	101.7	53.6	98.6	98.2	91.2	90.2	**.18**
Diff. in factors: 72 highest minus 72 lowest	**9.40**	520	8.1	−.8	.5	26.9	2.9	3.2	5.4	16.1	**.69**
Diff. in net earnings due to diff. in factors	.....	.....	$632	−$82	$24	$145	$271	−$100	−$86	−$116	**−$205**
(Factors that measure volume of business)											
L. Total charge for land, labor, and capital											
72 farms with largest businesses	**$156.40**	$8 640	102.2	70.7	99.7	66.1	100.6	105.4	95.2	103.8	.55
96 farms with medium-sized businesses	**161.50**	8 920	102.0	69.7	104.1	69.6	99.6	99.3	94.2	103.9	.49
72 farms with smallest businesses	**154.80**	8 550	100.1	70.1	103.8	66.2	99.6	97.2	93.8	91.1	.43
Diff. in factors: 96 medium minus 72 largest	**5.10**	280	−.2	−1.0	4.4	3.5	−1.0	−6.1	−1.0	.1	−.06
Diff. in net earnings due to diff. in factors	.....	.....	−$16	−$102	$209	$19	−$93	$191	$16	−$1	$18
Diff. in factors: 96 medium minus 72 smallest	**6.70**	370	1.9	−.4	.3	3.4	0	2.1	.4	12.8	.06
Diff. in net earnings due to diff. in factors	.....	.....	$148	−$41	$14	$18	0	−$66	−$6	−$92	−$18
M. Size of hog business (pounds per acre)											
72 farms producing most hogs	**172.80**	9 550	105.6	70.1	101.2	103.1	100.4	98.1	93.3	99.5	.54
96 farms producing medium amounts of hogs	**156.60**	8 650	101.9	70.0	102.9	65.0	99.3	99.7	93.6	103.1	.51
72 farms producing least hogs	**144.70**	8 000	96.8	70.2	104.0	35.3	100.1	103.9	96.4	96.6	.41
Diff. in factors: 72 most minus 72 least	**28.10**	1 550	8.8	−.1	−2.8	67.8	.3	−5.8	−3.1	2.9	.13
Diff. in net earnings due to diff. in factors	.....	.....	$687	−$10	−$133	$366	$28	$182	$50	−$21	−$39

of the $3,740 difference in net earnings between the highest-earning farms and lowest-earning farms (Table 3 and Fig. 3). Thus about a third (33.8 percent) of the total difference between these two groups was accounted for by differences in the yields of grain crops and differences in the profitableness of the crop systems.

The 72 farms with the highest crop-system ratings earned $740 more annually than the 72 farms with the lowest ratings (Fig. 3 and Table 5, row C). Crop yields were lower on farms with high crop-system ratings because they had less livestock and less legume hay and pasture.

Associated with high crop-system ratings and tending to make earnings high were: (1) low labor costs; (2) higher prices for products sold; (3) slightly lower building and fencing costs; and (4) slightly lower power and machinery costs. But on farms with high ratings, earnings were reduced because of (1) low crop yields; (2) low livestock-production efficiency; and (3) less livestock.

Efficiency in Producing Livestock

The difference in livestock-production efficiency[1] accounted for 11.4 percent, or $427 a farm annually, of the difference between the highest- and lowest-earning farms (Table 3 and Fig. 3). Only crop yields accounted for a higher proportion of the difference. On livestock farms, the efficiency with which the livestock are produced and fed often has as much effect on farm earnings as crop yields, sometimes even more.

Annual net earnings were $1,290 higher on the 72 farms that produced livestock most efficiently than on the 72 with lowest efficiency (Fig. 3 and Table 5, row D). Earnings on farms with high livestock-production efficiency were helped because of (1) high crop yields; (2) slightly lower power and machinery costs; (3) slightly lower building and fencing costs; and (4) very little lower limestone and fertilizer costs. Tending to reduce earnings on these farms were (1) lower prices for products sold; (2) less profitable crop systems; (3) fewer livestock; and (4) higher labor costs.

Amount of Livestock

Only 3 percent ($112 annually) of the difference between the 72 highest-earning farms and the 72 lowest was accounted for directly by the difference in the intensity of livestock production on the two

[1] See page 37 for definition of index of livestock-production efficiency and method of calculating it.

groups of farms (Table 3 and Fig. 3). Among all factors considered, only differences in building and fencing costs and in limestone and fertilizer costs had less direct influence on net farm earnings.

During the ten years 1936-1945, production of livestock on these farms had a little advantage over the sale of crops, even assuming a market for all of the hay and pasture as well as the grain fed to livestock. Hogs showed a much larger profit than other classes of livestock during this period (Table 5, row M, and page 29).

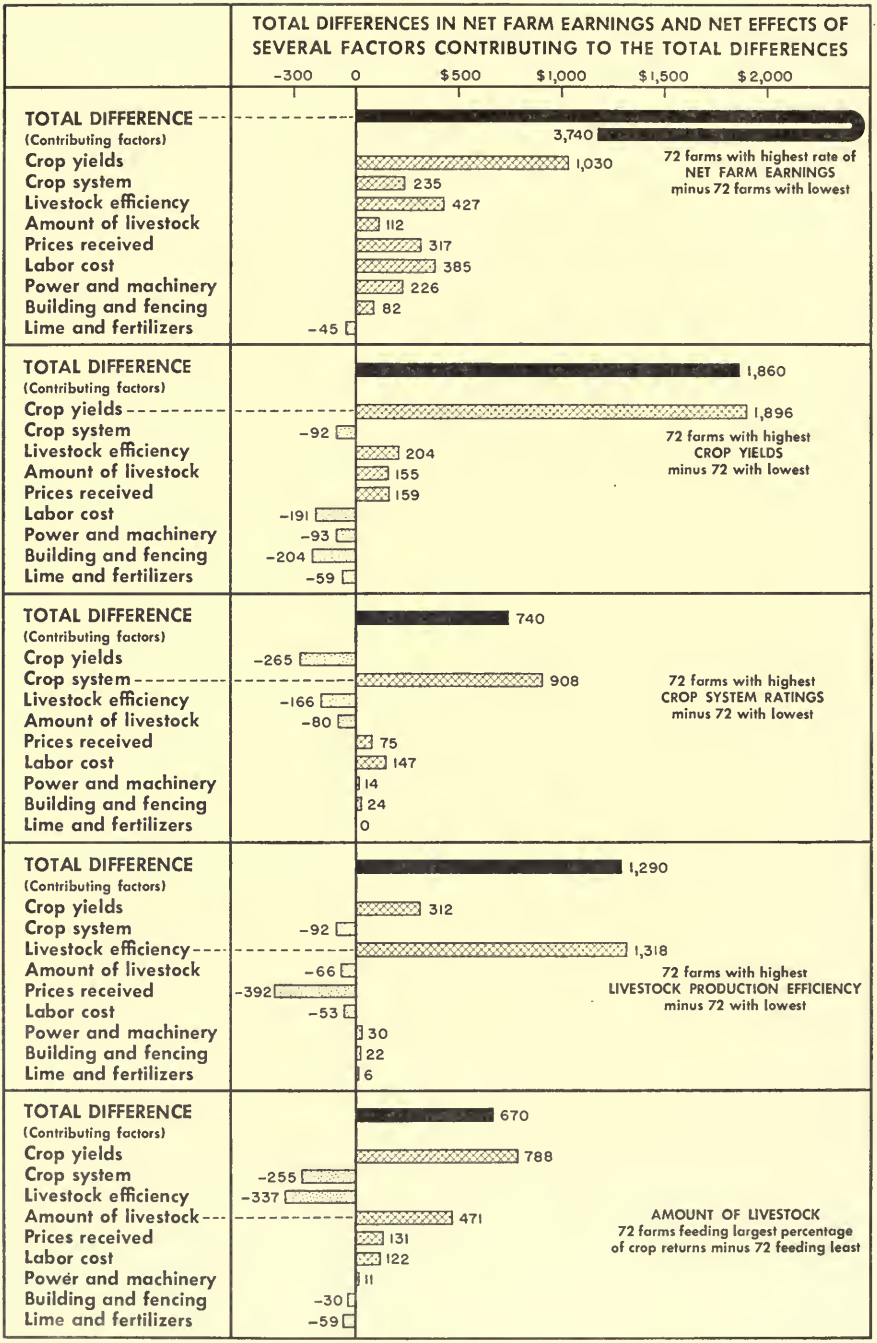
Amount of livestock was measured by the percent of the total value of all crop returns, including pasture, that was fed to productive livestock. It is thus a measure of intensity rather than of volume of the livestock part of the farm business. Seventy-two farms fed 115.7 percent of the value of all crop returns during the ten years while 72 others fed only 28.4 percent. The 72 having the most livestock had average annual net earnings of $670 a farm more than the 72 with least livestock (Fig. 3 and Table 5, row E). More of this $670 was due to the higher crop yields on the livestock farms than to the profits from the greater amount of livestock kept. Farm records in north-central Illinois have shown this same condition for many years. As has been said repeatedly, the most valuable livestock product on many farms is the manure.

On farms that had large amounts of livestock, earnings tended to be increased because of (1) much higher crop yields; (2) higher prices for products sold; (3) low labor costs; and (4) slightly lower power and machinery costs. On the other hand, earnings on farms with most livestock were offset some by (1) lower livestock-production efficiency; (2) less profitable crop systems; (3) higher costs for limestone and fertilizers; and (4) higher building and fencing costs.

Prices Received

Differences in prices of products sold accounted for 8.5 percent of the difference of $3,740 in net farm earnings between the 72 highest-earning farms and the 72 lowest. This amounted to $317 a farm annually. Price was the fourth most effective factor in making rate of return high or low (Table 3 and Fig. 3).

In this study, the measure of the average price of all products sold is the price index. The price index of a farm shows the percentage which prices received on that farm was of average prices (see page 37). Table 6 shows the prices received on the 72 farms with the highest price indexes and on the 72 with lowest indexes, as well as the average quantities sold on all 240 farms.



Net effects of several factors on farm earnings and their relationships to each other. (Not all differences in farm earnings are accounted for by these factors.) (Fig. 3)

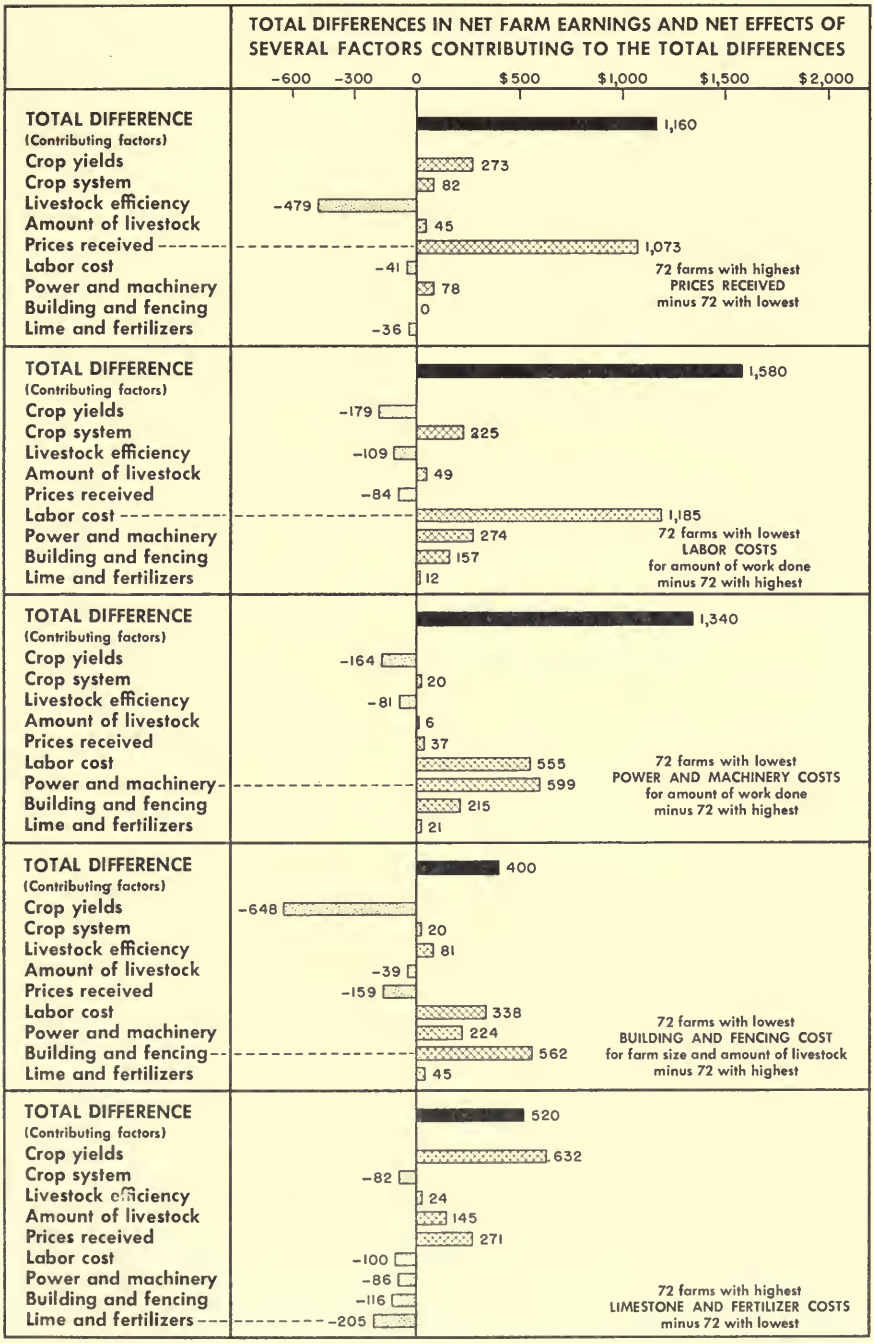


Fig. 3. — Concluded.

Table 6. — Prices and Values of Products Sold on Farms Studied, 1936-1945

Product sold	Average quantity sold, all 240 farms	Average price received, all 240 farms	Average value, all 240 farms	Prices received on 72 farms with highest average prices for all products	Prices received on 72 farms with lowest average prices for all products	Differences in prices received by two groups
Corn	3 075 bu.	$ .79	$2 425	$ .83	$ .75	$.08
Oats	992 bu.	.46	459	.48	.44	.04
Wheat	115 bu.	1.00	115	1.05	1.01	.04
Soybeans	566 bu.	1.45	820	1.53	1.36	.17
Cattle	33 165 lb.	11.90[a]	3 947	12.73	11.04	1.69
Hogs	36 234 lb.	10.89	3 945	11.29	10.51	.78
Sheep	5 268 lb.	10.39	547	10.66	9.97	.69
Milk	42 825 lb.	2.01	860	2.14	1.76	.38
Eggs	1 168 doz.	.284	332	.297	.273	.024
Total value	.....	....	$13 450	....	....	....

[a] See page 38 for average prices of different classes of cattle.

Largest sales were from corn, cattle, and hogs. Some of the apparent price advantage of cattle was not real because the price paid for feeder cattle was not considered when calculating the price index. Fat cattle that sold for the best prices usually cost more than those that sold for low prices. Some farms had a small ten-year advantage and others a small disadvantage because they increased or decreased in size during 1941 to 1945, when prices were much higher than during the first five years of the period. Sixty-one farms that increased in size had ten-year average price indexes of 101, and 33 that became smaller had indexes of 97.

Seventy-two farms received 5.9 percent more than average prices for their farm products and 72 others received 5.6 percent less than average prices. These differences accounted for an annual difference of $1,073 in net earnings between the two groups of farms (Fig. 3 and Table 5, row F).

Contributing to higher earnings on farms with high price indexes was the fact that the farms also had (1) higher crop yields; (2) more profitable crop systems; (3) lower power and machinery costs; and (4) more livestock. But earnings on these same farms tended to be reduced because of (1) much lower livestock-production efficiency; (2) higher labor costs; and (3) higher costs for limestone and fertilizers.

Labor Costs

Keeping labor costs low for the amount of work done had more effect on farm earnings than any other efficiency factor except crop yields and livestock-production efficiency. Of the $3,740 difference in

net earnings between the 72 highest-earning farms and the 72 lowest farms, 10.3 percent, or $385 annually, was accounted for by the difference in labor cost (Table 3 and Fig. 3). Average labor costs on farms devoting different amounts of work to crops and livestock are shown in Table 7. Efficiency in use of labor on the farms in this study was measured by the percent their labor costs were of normal labor costs (see page 38).

Differences in labor costs are due to both total amount of labor used and wages paid to hired men. All family labor and operator labor were charged at the same rate on all farms, so any differences in wage rates for all labor were due to differences in wages paid hired men. On the high-earning farms a larger proportion of the work was done with family and operator labor than on the low-earning farms (Table 8).

The 72 farms having lowest labor costs for the amount of work done on crops and livestock had net earnings of $1,580 a farm annually more than the 72 farms with highest labor costs (Fig. 3 and Table 5, row G). Difference in labor costs accounted for $1,185 of this difference in earnings. Associated favorably with low labor costs for the amount of work done were (1) lower power and machinery costs; (2) more profitable crop systems; (3) lower building and fencing costs; (4) more livestock; and (5) slightly lower costs for limestone and fertilizer. On the other hand, three things tended to decrease earnings on farms with low labor costs: (1) lower crop yields; (2) lower

Table 7. — Labor Costs as Related to Amounts of Work on Crops and Livestock[a]

	Labor costs on farms with—				Increase in labor cost per day of work increase on livestock	Total number of farms in crop-size groups
	50 to 149 days of work on livestock	150 to 249 days of work on livestock	250 to 349 days of work on livestock	350 to 449 days of work on livestock		
Labor costs on farms with—						
50 to 149 days of work on crops	$ 950 (19)	$1 200 (48)	$ 1 460 (27)	$1 710 (8)	$2.54	(102)
150 to 249 days of work on crops	1 550 (11)	1 780 (43)	2 010 (24)	2 240 (17)	2.28	(95)
250 to 349 days of work on crops	2 170 (2)	2 370 (11)	2 560 (8)	2 760 (7)	2.00	(28)
Increase in labor cost per day of work increase on crops	$6.12	$5.80	$5.52	$5.25	....	....
Total number of farms in livestock-size groups	(32)	(102)	(59)	(32)	....	(225)

[a] Based on ten-hour days of work. Figures in parentheses are numbers of farms. Only 3 of all 240 farms had more than 349 days of work on crops and only 12 had more than 449 days of work on livestock. None had less than 50 days of work on crops or livestock.

Table 8. — Hired, Family, and Operator's Labor Used Annually and Wages Paid

Item	Average of all 240 farms	72 high-earning farms	96 medium-earning farms	72 low-earning farms	72 farms with highest labor costs	96 farms with medium labor costs	72 farms with lowest labor costs
Months of man-labor used annually—							
Hired	9.8	9.4	10.2	9.8	13.1	9.4	6.9
Family	3.6	3.9	3.5	3.4	4.1	3.9	2.8
Operator	10.8	11.0	10.6	10.8	10.6	11.0	10.7
Total	24.2	24.3	24.3	24.0	27.8	24.3	20.4
Percent of total labor that was—							
Hired	40.6	38.7	42.0	40.8	47.1	38.7	33.8
Family	14.8	16.0	14.4	14.2	14.8	16.0	13.7
Operator	44.6	45.3	43.6	45.0	38.1	45.3	52.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average monthly wages paid hired men	$82.56	$84.04	$82.06	$81.73	$85.75	$81.50	$80.84
Man-work units per farm	....	....	....	....	423	433	416
Number of men per farm	....	....	....	....	2.32	2.02	1.70
Man-work units per man	....	....	....	....	183	214	245

livestock-production efficiency; and (3) lower prices received for products sold.

Increasing labor requirements on livestock increased labor costs less than half as much as increasing labor requirements to the same extent on crop production. When the time required for work on livestock was held constant, an increase of one 10-hour day of work on crops was accompanied by an increase in labor costs of $5.25 on farms having 350 to 449 days of work on livestock and $6.12 on farms having only 50 to 149 days of work on livestock (Table 7). The weighted average increase was $5.70.

In contrast, when the time required for work on crops was held constant, an increase of one 10-hour day of work on livestock was accompanied by an increase in total farm labor costs of only $2.00 on farms having 250 to 349 days of work on crops and $2.54 on farms having only 50 to 149 days. The weighted average increase was only $2.36.

These data show the value of expanding the production of kinds of livestock that do not interfere with efficient crop production but make good use of labor during hours of the day and seasons of the year when it is not needed for crop work. Such a practice may be one of the causes of the relatively high earnings on hog and feeder-cattle farms as compared with earnings on grain farms and farms having other kinds of livestock.

Farms with high labor costs had more labor available and paid higher wages. Most of the difference in labor charges between farms with high labor costs and those with low costs was due to there being more labor available on the high-cost farms for the amount of work to be done. With less than 2 percent more work to be done (423 and 416 man-work units), the 72 farms with high labor costs had 36 percent more men available (2.32 and 1.70 men a farm respectively) than the 72 with low labor costs (Table 8).

Hired men on farms with high labor costs received higher wages than those on the low-cost farms. Average monthly wages were $85.75 on the 72 high-labor-cost farms, $81.50 on the 96 medium farms, and $80.84 on the 72 low-cost farms.

Power and Machinery Costs

High costs for power and machinery held net earnings down on many farms. They ranked fifth among the ten efficiency factors studied. Differences in power and machinery costs accounted for 6.0 percent, $226 annually, of the $3,740 difference in net earnings between the 72 farms with highest earnings and the 72 with lowest earnings (Table 3 and Fig. 3). Average power and machinery costs on farms using different amounts of work for crops and livestock are shown in Table 9.

Table 9.—Power and Machinery Costs as Related to Amounts of Work on Crops and Livestock[a]

	Power and machinery costs on farms with—				Increase in power and machinery cost per day of work increase on livestock	Total number of farms in crop-size groups
	50 to 149 days of work on livestock	150 to 249 days of work on livestock	250 to 349 days of work on livestock	350 to 449 days of work on livestock		
Power and machinery costs on farms with—						
50 to 149 days of work on crops	$ 780 (19)	$ 880 (48)	$ 980 (27)	$1 090 (8)	$1.01	(102)
150 to 249 days of work on crops	1 310 (11)	1 470 (43)	1 630 (24)	1 790 (17)	$1.59	(95)
250 to 349 days of work on crops	1 860 (2)	2 060 (11)	2 280 (8)	2 490 (7)	$2.11	(28)
Increase in power and machinery cost per day of work increase on crops	$5.33	$5.93	$6.47	$7.00	.....	....
Total number of farms in livestock-size groups	(32)	(102)	(59)	(32)	.....	(225)

[a] Based on ten-hour days of work. Figures in parentheses are numbers of farms. Only 3 of all 240 farms had more than 349 days of work on crops and only 12 had more than 449 days of work on livestock. None had less than 50 days of work on either crops or livestock.

During the ten-year period, the 72 farms with lowest costs for power and machinery earned an average of $1,340 more annually than the 72 with highest costs (Fig. 3 and Table 5-H2). However only $599, less than half, of the total difference was traced directly to the difference in power and machinery costs (Table 5-H9). Low and high labor costs are closely associated with low and high power and machinery costs.

Helping to increase farm earnings on farms with low power and machinery costs for the amount of work done were the following: (1) much lower labor costs; (2) lower building and fencing costs; (3) higher prices received for products sold; (4) slightly lower costs for limestone and fertilizer; (5) slightly more profitable crop systems; and (6) a very little more livestock. Tending to reduce earnings on the same farms were lower crop yields and lower livestock-production efficiency.

Power and machinery costs increased less with more livestock work than with more crop work. When the time required for work on livestock was held constant, an additional 10-hour day of work on crops was accompanied by an increase in total power and machinery costs of $5.33 on farms with 50 to 149 days of work on livestock and $7.00 on farms with 350 to 449 days of work on livestock. The weighted average increase was $6.14. Except for farms having the least livestock, an additional day of work on crops was accompanied by a greater increase in power and machinery costs than in labor costs (Tables 7 and 9).

On the other hand, when the time required for work on crops was held constant, an increase of one 10-hour day of work on livestock was accompanied by an increase of $1.01 in power and machinery costs on farms doing only 50 to 149 days of work on crops and $2.11 on farms doing 250 to 349 days of work on crops (Table 9). The weighted average increase for a day's increase of work on livestock was $1.39.

Net farm earnings were lower on farms slowest to change from horse to mechanical power. Horse costs made up 21.6 percent of all power and machinery costs on 72 farms and 6.6 percent on 72 other farms during the ten years 1936-1945. (Horse costs included depreciation and feed costs.) The 72 farms having lowest horse costs had average net earnings of $7.00 more per $100 charged for use of land, labor, and capital than the 72 farms with highest horse costs. This amounted to a difference of about $390 a farm annually (Table 10).

Total power and machinery costs were the same on the two groups

Table 10. — Relation of the Percent That Horse Costs Were of Total Power and Machinery Costs to Farm Earnings and Other Factors

Item	Average of all 240 farms	Average of 72 farms with lowest horse costs	Average of 96 farms with medium horse costs	Average of 72 farms with highest horse costs
Percent that horse costs were of power and machinery costs	13.6	6.6	13.0	21.6
Net farm earnings per $100 charged for land, labor, and capital	$158	$161	$159	$154
Percent of normal power and machinery costs	94	94	95	94
Percent of normal labor costs	100	97	100	104
Crop-system rating	70	72	70	68
Percent of tillable land in:				
All hay and pasture	23.6	21.0	23.8	25.9
Biennial and perennial legumes	20.1	18.6	20.1	21.6
Nonlegume hay and pasture	3.0	2.3	3.1	3.7
Crop-yield index	101	100	102	102
Livestock-production index	103	102	102	104

of farms, but labor costs were 7 percent higher on the farms with higher horse costs. Other differences were: (1) The farms with most horses had a less profitable crop system; they had more land in all hay and pasture, biennial and perennial legumes, and nonlegume hay and pasture. (2) Net farm earnings were lower on farms with the most horses even though crop yields and livestock-production efficiency were slightly higher.

Building and Fencing Costs[1]

Differences in building and fencing costs accounted for only a small part of the differences in net farm earnings between the 72 highest-earning farms and the 72 lowest-earning farms. Their net effect was only 2.2 percent ($82 a farm annually) of the $3,740 difference in net earnings between the two groups of farms (Table 3 and Fig. 3). On some individual farms, however, high building and fencing costs were a major cause of low farm earnings.

The 72 farms having lowest building and fencing costs for the size

[1] Records of building and fencing costs are less satisfactory than other records for three reasons. First, farms have differed widely in the rate of deductions for depreciation and remodeling costs. Second, on many rented farms the farm residence was included in the landlord's capital investment, and deductions for depreciation and upkeep of the residence were included with the building and fencing costs. This was not done for owner-operated farms and some rented farms. (In 1951 a separate account for the farm residence was entered in the Illinois Farm Account Book so it may be included or not in making income-tax returns and so that all farms can be treated alike when farm-business analyses are made.) Third, the building and fencing account and the limestone and fertilizer account were combined in one account during the first four years; for this study the costs for the four years were separated on the same percentage basis as they appeared in the records of the last six years. This lead to some irregularities on some farms.

of farm and amount of livestock earned an average of $400 a farm annually more than the 72 farms having highest building and fencing costs (Fig. 3 and Table 5-J2). This difference was not nearly as great as the $562 difference due to the net effect of building and fencing costs would indicate (Table 5-J10). It is true that several factors helped to increase earnings on farms with low building and fencing costs: (1) lower labor costs; (2) lower power and machinery costs; (3) higher livestock-production efficiency; (4) lower costs for limestone and fertilizer; and (5) slightly more profitable crop systems. But on farms with low building and fencing costs, crop yields were very much lower (causing a greater difference than that due to the net effect of building and fencing cost itself), lower prices were received for products sold, and there were fewer livestock.

Building and fencing costs rose as the size of farm and amount of livestock increased. Average annual building and fencing costs on farms of 100 to 179 acres and having livestock requiring 50 to 149 days of labor was $220. Increasing livestock on such small farms without changing size of farm increased building and fencing costs about 63 cents for each additional day of labor required for livestock (Table 11). Increasing size of farm without changing amount of livestock increased the building and fencing costs by about 90 cents for each additional acre.

Table 11. — Building and Fencing Costs as Related to Size of Farm and Amount of Livestock[a]

	Building and fencing costs on farms with—				Increase in building and fencing costs per day of work increase on livestock	Total number of farms in size-of-farm groups
	50 to 149 days of work on livestock	150 to 249 days of work on livestock	250 to 349 days of work on livestock	350 to 449 days of work on livestock		
Building and fencing costs on farms of—						
100 to 179 acres[b]	$220	$275	$345	$410	$.63	
	(11)	(16)	(10)	(2)		(39)
180 to 259 acres	270	325	390	460	.63	
	(11)	(46)	(14)	(9)		(80)
260 to 339 acres	340	400	475	555	.72	
	(5)	(23)	(23)	(10)		(61)
340 to 419 acres	420	500	585	675	.85	
	(5)	(9)	(7)	(3)		(24)
420 to 499 acres	500	600	700	800	1.00	
	(0)	(8)	(2)	(7)		(17)
Increase in building and fencing costs for one acre increase in size	.90	1.01	1.11	1.22	...	....
Total number of farms in livestock-size groups	(32)	(102)	(56)	(31)	...	(221)

[a] Based on ten-hour days of work. Figures in parentheses are numbers of farms. Only 8 farms were over 499 acres in size and only 12 had more than 449 days of work on livestock.
[b] Including one farm of 84 acres.

As an average of all the farms, increasing the amount of livestock without changing the size of farm resulted in an average increase in building and fencing cost of 70 cents for each additional day of labor required for livestock. Each additional acre of increase in size of farm with no change in the livestock enterprise meant an increase of $1.05 in building and fencing costs.

The increase in building and fencing costs resulting from each additional day of work on livestock was greater for larger farms. In the same way, the increase resulting from increasing the size of farm was greater on farms with large amounts of livestock.

Cost of Limestone and Fertilizer[1]

The 72 highest-earning farms used about 36 percent more limestone and phosphate and other purchased fertilizer per tillable acre than was used on the 72 lowest-earning farms (Table 3). In Table 5 therefore the highest-earning farms appear to show a loss for the use of limestone and fertilizer. Actually, however, as the cost was increased, crop yields and net farm earnings both went up (Fig. 3 and Table 5, row K).

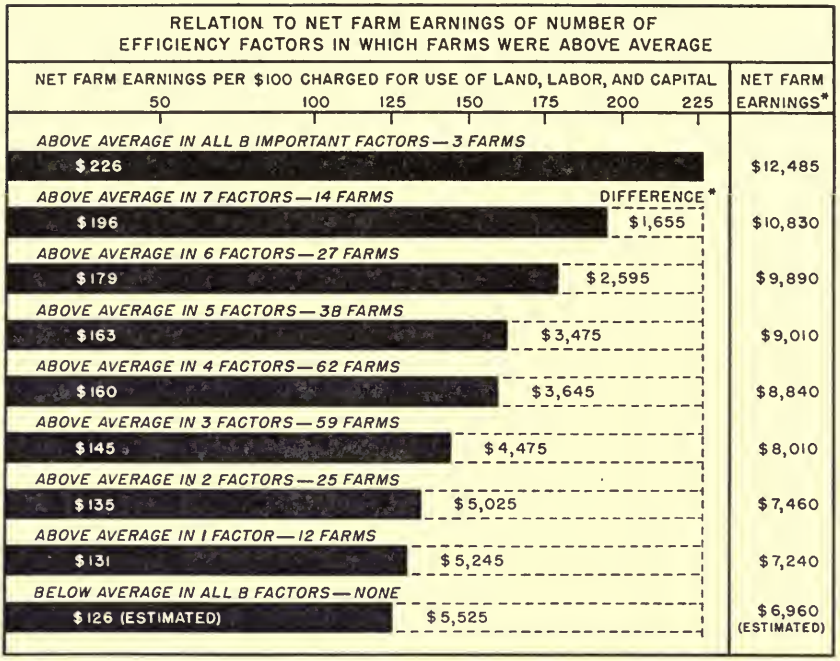
The 72 farms applying the most limestone and fertilizer used an average of 87 cents' worth per tillable acre annually during the ten years 1936 to 1945. Seventy-two other farms used only 18 cents' worth, about a fifth as much (Table 5-K11). Farms applying the most had 8.1 percent higher yields of grain crops and earned $520 a farm more.

Helping to increase earnings on farms applying the most limestone and fertilizer were: (1) much higher crop yields; (2) higher prices for products sold; (3) more livestock; and (4) slightly higher livestock efficiency. Tending to decrease earnings on such farms were: (1) higher building and fencing costs; (2) higher labor costs; (3) higher power and machinery costs; and (4) less profitable crop systems.

Well-Balanced Farm Programs Most Profitable

Eight of the efficiency factors discussed in the preceding pages had significant effects on farm earnings. These were: crop yields, crop system, livestock-production efficiency, amount of livestock, prices of products sold, labor costs, power and machinery costs, and building and fencing costs. The records of the 240 farms were studied to learn the effect on farm earnings of being in the upper or lower half of the group in these factors.

[1] As explained in the footnote on page 23, the limestone and fertilizer account was combined with the building and fencing account during the first four years.



* Adjusted to average total charges for land, labor, and capital on 240 farms.

The value of all-round good farming is shown by the higher earnings on the more efficient farms. The efficiency factors considered were: crop yields, crop systems, livestock production efficiency, amount of livestock, prices received for farm products, percent of normal labor costs, percent of normal power and machinery costs, and building and fencing costs. (Fig. 4)

Three farms were so organized and operated that they were among the upper half in efficiency in each of the eight factors. They averaged $226 a year per $100 charged for the use of land, labor, and capital (Fig. 4). Fourteen farms above average in seven of the eight factors had net earnings of $196 per $100 charged for the use of land, labor, and capital; 27 farms above average in six factors earned $179; 38 farms above average in five factors earned $163; 62 farms above average in four factors, $160; 59 farms above average in only three factors, $145; 25 farms above average in only two factors, $135; and 12 farms above average in only one factor earned only $131. No farms were below average in all eight factors, but projecting the trend indicates that if there had been any, they would have earned an average of only $126 per $100 charged for the use of land, labor, and capital.

On the basis of these returns, the 240 farms would have averaged about $3,755 more a year if all had done as well as the three that

were in the upper half in all eight factors. For an average use of $5,525 charged for land, labor, and capital, these three earned $12,485 annually, compared with the average of $8,730 for all 240 farms. Likewise, if there had been any who did not come up to average in any of the eight factors, they would have earned $1,770 less than the average.

This emphasizes again that it pays to do well in all parts of the farm business and emphasizes also the value to the individual farmer of making a careful study of his farm business.

In order to test the accuracy of the above analysis, the average measure of each of the eight factors was calculated both for the 120 farms highest in that factor and for the 120 lowest. Then the net effect per unit of each factor on net earnings per $100 charged for land, labor, and capital was applied to the average difference between the 120 farms high in that factor and the 120 farms low in that factor. This difference was then applied to the average total charges, $5,525 for the use of land, labor, and capital. The calculations are shown in Table 12. According to this analysis, the average of the 120 farms highest in crop yields had an annual advantage of $1,287 in net farm earnings over the 120 farms lowest in crop yields, because of the higher crop yields. Advantages due to being high rather than low in other factors are shown in Table 12. The total estimated annual difference per farm between the farms highest in all eight factors and those lowest was

Table 12. — Calculated Net Effects on Farm Earnings of Being Above or Below Average in Each of Eight Efficiency Factors That Had Most Effect on Net Farm Earnings

Efficiency factors	Average of 120 farms high in each factor	Average of 120 farms low in each factor	Average difference between 120 high and 120 low in each factor	Net effect per unit of factor on $100 charged for land, labor, and capital[a]	Differences between 120 high and 120 low farms	
					Per $100 charged for land, labor, and capital	Per average farm having $5,525 charged for land, labor, and capital
Crop-yield index	109.7	93.2	16.5	$1.4123	$23.30	$1 287
Crop-system rating	73.2	67.0	6.2	1.8471	11.45	633
Livestock-production index	112.0	93.5	18.5	.8580	15.87	877
Percent of crops fed	97.8	37.3	60.5	.0977	5.91	327
Price index	103.8	95.9	7.9	1.6891	13.34	737
Percent of normal labor cost	87.7	113.2	−25.5	−.5673	14.47	799
Percent of normal power and machinery cost	81.6	107.2	−25.6	−.2898	7.42	410
Percent of normal building and fencing cost	73.6	126.4	−52.8	−.1300	6.86	379
Total calculated difference between farms above average and farms below average in all eight factors						$5 449

[a] See Table 2.

$5,449. The actual difference between the farms high in all eight factors and those low in all eight (theoretically, since none were actually low in all eight) was $5,525. Thus the actual difference checks closely with the calculated difference obtained by using the carefully calculated net effects of each factor on farm earnings.

VOLUME OF BUSINESS AS RELATED TO NET FARM EARNINGS

The preceding pages have discussed the relationships of several efficiency factors to the rate of earnings per $100 charged for the use of land, labor, and capital and to total net farm earnings. However, two things about the relation of volume of business to rate of earnings have been evident to the authors as the study progressed. First, the total volume of business as measured by the total charges for the use of land, labor, and capital had only little effect on the rate of net farm earnings, as indicated below. Second, the size of the hog enterprise had a great influence on both the rate of farm earnings and the total net earnings per farm.

Farms with medium-sized businesses had slightly higher rates of net farm earnings than farms with large or small businesses. Their advantage was not great. Ninety-six farms with medium-sized businesses, as measured by the total charges for use of land, labor, and capital, had average net farm earnings of $6.70 more per $100 charged for the use of land, labor, and capital than the 72 farms with smallest businesses and $5.10 more than the 72 farms with largest businesses (Table 5, row L). The slight advantage in rate of earnings for medium-sized farms in north-central Illinois has been noted in farm-record analyses for many years.

The greatest advantage of the medium-sized farm businesses over the small businesses evidently was in the 50-percent larger volume of hog production. Other small advantages were higher crop yields and a larger proportion of crops fed. Their advantage over the large businesses was due to four factors: (1) greater livestock efficiency; (2) a larger percentage of crop returns fed on the farm; (3) lower labor costs for amount of work done; and (4) slightly lower power and machinery costs for amount of work done.

Farms that became larger during the ten years had higher average annual rates of earnings than those that stayed the same size or became smaller. Earnings for 61 farms that increased in size were

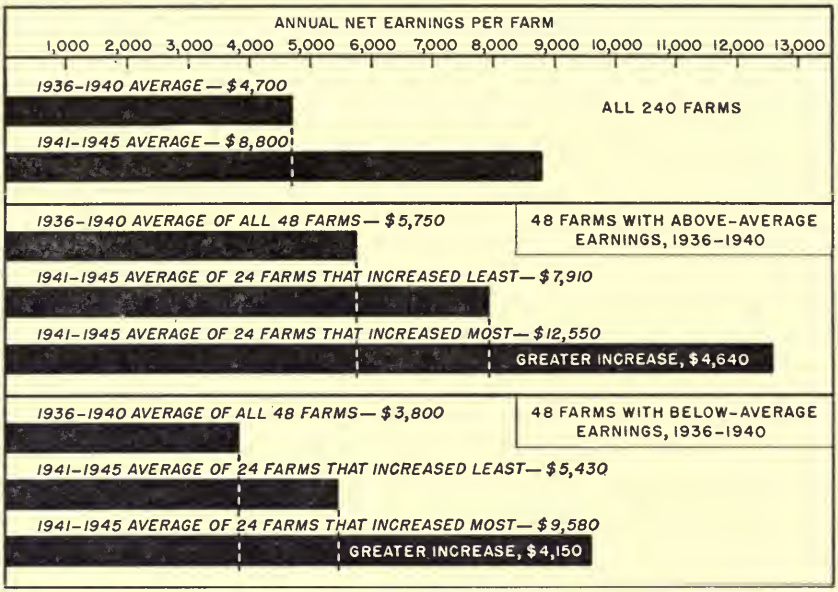
$163 per $100 charged for the use of land, labor, and capital and were only $156 for 122 that stayed the same size and 33 that became smaller. The advantage for the farms that increased in size was evidently due to their larger volume of business during the last five years of the period, when the rate of earnings was highest.

Part of the $965 difference between the high- and low-earning groups of farms which was not accounted for when the net effects of ten efficiency factors were calculated (Table 3) was probably due to the fact that more of the high-earning farms than the low-earning farms increased in size during the period. Twenty-five of the 72 high-earning farms and only 15 of the 72 low-earning farms became larger during the ten years.

Size of hog business. The 72 farms that had the highest rate of net farm earnings produced an average of 52,800 pounds of hogs annually, while the 72 farms with the lowest rate produced only 22,900 pounds. Profits from hogs averaged $1.43 per 100 pounds produced for the ten years.[1] If hogs were produced with equal efficiency on the two groups of farms, this profit would give an advantage due to profits from hogs of $428 in favor of the high-earning farms. Livestock-production efficiency, however, was greater on the more profitable farms (Fig. 3 and Table 5, row A), so the real difference in earnings due to the greater hog production was probably more than $428. This accounts for much of the difference in earnings that was not accounted for by the effects of the ten efficiency factors. The difference in earnings due to large volume of hog production, however, was greater than can be expected during more normal times, for during the ten years hog production showed greater-than-average profit.

Farms producing large numbers of hogs had much higher rates of net earnings than those producing small numbers of hogs. Seventy-two farms produced an average of 70,400 pounds of hogs annually and had net earnings of $9,550 a farm; 72 others produced only 10,100 pounds and had net earnings of only $8,000 a farm (both groups based on average size of farm business). The difference in earnings between these two groups was thus $1,550 a farm annually. Differences in profits from the hog enterprise accounted for $860 of this difference. About $700 of the difference was due to the 8.8 percent higher yields of grain crops on those farms producing the most hogs (see Table 2 for

[1] The cost of producing hogs used in this study was the average cost on farms in Champaign and Piatt counties during the ten years 1936 to 1945, as determined by the Department of Agricultural Economics.



Farmers whose earnings were already above average increased their earnings more during the period than did farmers whose 1936-1940 earnings were below average. Average annual net farm earnings were calculated by applying the average rate of the group to the average capital investment of all 240 farms. (Fig. 5)

net effect of crop yields on net farm earnings). Other efficiency factors had only minor influences up or down on the net farm earnings of the two groups of farms.[1]

HOW SOME FARMS INCREASED THEIR EARNINGS MORE THAN OTHERS

Net farm earnings on the 240 farms averaged $4,700 per farm annually during 1936 to 1940, and $8,800 annually during 1941 to 1945. While most of this increase was due to wartime conditions during the last five years, some of it was undoubtedly due to increased efficiency. A fifth of the 240 farms increased their earnings during the period by $4,400 more than another fifth increased theirs (Fig. 5).

Earnings advanced more on high-earning farms than on low-earning farms. For the 240 farms the median rate earned on the in-

[1] For a fuller discussion of the effect of volume of hog production on net farm earnings, see Illinois Bulletin 548, "Livestock Earnings on North-Central Illinois Farms."

vestment[1] increased from 8.1 percent during 1936 to 1940 to 15.0 percent during 1941 to 1945, an increase of 6.9 in the rate. The farms were divided for further study into two groups of 120 farms each: those that earned more than 8.1 percent during the first five years, and those that earned less than 8.1 percent. This was done in order to learn if there was any difference between low-earning and high-earning farms in their ability to increase their earning power.

From each group of 120 farms, 48 farms were selected; 24 were from those in the group that showed the largest percentage increase in rate earned, and 24 from those that showed the smallest percentage increase in the rate earned. Within each group of 120, the 24 farms that had a large percentage increase and the 24 with a low increase were selected in such a way that for each farm that increased most there was one that increased least that earned approximately the same during the first five years.

The rate for the 24 high-earning farms selected from those that increased most rose from 9.8 percent for 1936-1940 to 21.5 percent for 1941-1945. This was an increase of 11.7 in the average rate earned on investment (Table 13). The rate for the 24 high-earning farms selected from those that increased least went from 9.9 percent for 1936-1940 to 13.6 percent for 1941-1945, an increase of 3.7 and much less than the increase for the 24 high-increase farms. The 48 high-earning farms earned an annual average of about $5,750 each during the prewar period (Fig. 5). The 24 from the group that increased the most earned average incomes of $12,550 during the years 1941 to 1945, which was $4,640 more a year than the 24 farms from the group that increased the least.

The 24 low-earning farms selected from those that increased most increased 7.1 points more than the 24 low-earning farms selected from the group that increased least (Table 13). This difference was less than the 8.0 difference for similar groups of high-earning farms.

The 48 low-earning farms (24 from each group) averaged $3,800 a farm a year during the prewar period of 1936 to 1940. The 24 from the group that increased least averaged $5,430 during the war years of 1941 to 1945. At the same time, the 24 selected from those that increased most earned $9,580 a farm, which was $4,150 more than the 24 low-increase farms earned.

[1] The rate earned on the investment in land and buildings and operating capital was used in this study because it had already been calculated annually for each farm and the annual net earnings per $100 charged for the use of land, labor, and capital based on adjusted land values had not been calculated. The prewar value of land was used in this particular study.

Table 13. — How Several Efficiency Factors Changed From 1936-1940 to 1941-1945 on 48 Farms With High Earnings in 1936-1940 and 48 With Low Earnings in Same Period

Item	Average of farms selected from 120 that increased most in rate of earnings			Average of farms selected from 120 that increased least in rate of earnings		
	First five years	Second five years	Net change	First five years	Second five years	Net change
Percent earned on investment						
24 high-earning farms	9.8	21.5	+11.7	9.9	13.6	+3.7
24 low-earning farms	6.5	16.4	+ 9.9	6.5	9.3	+2.8
Average of two groups	8.1	18.9	+10.8	8.2	11.4	+3.2
Yield of corn, bushels per acre						
24 high-earning farms	63.5	71.8	+8.3	64.6	69.8	+5.2
24 low-earning farms	58.3	68.2	+9.9	58.4	63.9	+5.5
Average of two groups	60.9	70.0	+9.1	61.5	66.9	+5.4
Yield of oats, bushels per acre						
24 high-earning farms	54.3	51.9	−2.4	53.0	48.9	−4.1
24 low-earning farms	49.8	47.8	−2.0	49.0	43.7	−5.3
Average of two groups	52.0	49.8	−2.2	51.0	46.3	−4.7
Percent of tillable land in corn						
24 high-earning farms	41.9	43.4	+1.5	40.1	40.7	+ .6
24 low-earning farms	40.6	41.4	+ .8	40.7	41.7	+1.0
Average of two groups	41.2	42.4	+1.2	40.4	41.2	+ .8
Percent of tillable land in hay and pasture						
24 high-earning farms	23.3	23.2	− .1	24.2	24.3	+ .1
24 low-earning farms	22.3	23.8	+1.5	25.7	25.6	− .1
Average of two groups	22.8	23.5	+ .7	24.9	24.9	0
Percent of gross farm earnings from grain						
24 high-earning farms	22.3	20.2	−2.1	33.3	30.0	−3.3
24 low-earning farms	33.5	28.0	−5.5	36.8	32.4	−4.4
Average of two groups	27.9	24.1	−3.8	35.0	31.2	−3.8
Livestock-efficiency index						
24 high-earning farms	105.3	111.2	+5.9	102.1	103.4	+1.3
24 low-earning farms	92.9	100.8	+7.9	97.2	94.0	−3.2
Average of two groups	99.1	106.0	+6.9	99.6	98.7	− .9
Number of forage-consuming animal units						
24 high-earning farms	31.6	29.4	−2.2	48.1	52.5	+4.4
24 low-earning farms	29.1	29.7	+ .6	41.3	40.0	−1.3
Average of two groups	30.3	29.5	− .8	44.7	46.2	+1.5
Percent of normal labor cost						
24 high-earning farms	103.7	91.2	−12.5	102.8	103.7	+ .9
24 low-earning farms	106.0	94.0	−12.0	112.0	115.0	+3.0
Average of two groups	104.8	92.6	−12.2	107.4	109.3	+1.9
Percent of normal power and machinery cost						
24 high-earning farms	98.6	89.4	− 9.2	92.7	101.7	+9.0
24 low-earning farms	104.0	90.0	−14.0	102.0	111.0	+9.0
Average of two groups	101.3	89.7	−11.6	97.3	106.3	+9.0
Size of farm, total acres						
24 high-earning farms	246	275	+29	289	307	+18
24 low-earning farms	273	265	− 8	268	268	0
Average of two groups	259	270	+11	278	287	+ 9
Pounds of hogs produced						
24 high-earning farms	53 500	88 700	+35 200	28 300	40 200	+11 900
24 low-earning farms	29 300	54 600	+25 300	17 600	22 100	+4 500
Average of two groups	41 400	71 650	+30 250	22 950	31 150	+8 200

Thus farmers who were already making their farms earn most, increased their earning power during the war years a little more than those who had earned least during the prewar years. The percentage increase, however, was greater on the low-earning farms.

In the two groups the 48 farms that increased their earnings the most (1 in 5 of all farms) realized more than $20,000 a farm greater increases in earnings during the five years 1941 to 1945 than the 48 that increased earnings least. Both groups had earned the same during 1936-1940.

How did some farmers increase their earning power so much more than others? Aside from causes outside the operator's control, there can be no such increase in farm earning power without changes in the ways in which the farms are organized and operated. The following changes in efficiency factors among the 48 farms that increased most (10.8 points in rate earned) as compared with the 48 farms that increased least (3.2 points in rate earned) account for most of the differences in net earnings.

Livestock efficiency was increased more. More of the farms that increased their earnings the most increased livestock efficiency than increased the efficiency of any other factor. The index of livestock efficiency rose 6.9 points on the farms with a high increase in earnings and dropped 0.9 point on the low-increase farms.

Crop yields went up more. Average corn yields were 9.1 bushels higher during 1941-1945 than during 1936-1940 on the 48 farms that increased most and only 5.4 bushels higher on the 48 farms that increased least. Oat yields declined less on the farms that increased most in earnings.

Labor costs were reduced. Labor costs were cut 12.2 percentage points on the 48 farms that increased most in earnings and went up 1.9 points on the 48 that increased least.

Power and machinery costs differed widely. Power and machinery costs were reduced 11.6 percentage points on the 48 farms that increased their earnings the most and went up 9.0 points on the 48 farms that increased their earnings the least.

The reduction in cost of both labor and power and machinery on several of the farms that had the greatest increase in earnings was not due to an actual reduction in those costs but was due to the greater acreages of crops and amounts of livestock produced with the same amounts of labor and power and machinery. During the war some farmers were forced to work with less labor and machinery. It is to

their credit that they did this with increases in efficiency of crop and livestock production.

Hog production was increased more. The 48 farms that increased most in earnings produced 30,250 more pounds of hogs annually during the war years than during the prewar years. The 48 that increased least raised only 8,200 pounds a year more during the same time. This greater increase of 22,050 pounds of hogs a year was enough to cause a greater increase of about $300 a year in net farm earnings.

EXPLANATION OF TERMS USED IN THIS STUDY

Net earnings per $100 charged for the use of land, labor, and capital. See Table 14 for method of calculating this measure. It differs from "rate earned on investment" in that it credits profits and management returns to land, *labor,* and capital rather than to land and capital alone.

Table 14. — Method of Calculating for a Typical Farm Each Measure of Farm Earnings Referred To in This Study

Basic data	
Farm investment	
Bare land	$71 342
Buildings, fences, and land improvements	10 293
Machinery, livestock, and feed and grain	16 001
Total farm investment	$97 636
Farm and family earnings	
Total cash income	$14 162
Total cash expense	6 671
Cash balance	$ 7 491
Inventory change	+1 016
Home-used farm produce	303
Total farm and family earnings	$ 8 810
Net earnings per $100 charged for use of land, labor, and capital	
Total farm and family earnings	$ 8 810
Total paid for hired labor	1 135
Net earnings for use of land, labor, and capital	$ 9 945
Charges for use of land, labor, and capital	
Land (4 percent of value of bare land)	2 854
Labor (all hired, family, and operator's labor)	2 139
Capital (5 percent of farm investments other than land)	1 315
Total charges	$ 6 308
Net earnings per $100 charged for use of land, labor, and capital ($9,945÷$6,308×100)	$ 158
Rate earned on investment	
Total farm and family earnings	$ 8 810
Unpaid family and operator's labor	1 004
Returns for investments and management	$ 7 806
Rate earned on investment ($7,806÷$97,636×100), percent	8.0
Operator's labor and management earnings	
Total farm and family earnings	$ 8 810
Unpaid family labor (other than operator's)	265
Returns for operator's labor, management, and capital	$ 8 545
Interest on farm investments (4 percent of value of bare land plus 5 percent of value of buildings, fences, land improvements, and operating capital)	4 169
Operator's labor and management earnings	$ 4 376
Management earnings	
Operator's labor and management earnings	$ 4 376
Operator's labor	739
Management earnings	$ 3 637

The average charges for all 240 farms for the use of land, labor, and capital were:

Land (4 percent of the average land value of $65,592)	$2,624
Labor (hired, family, and operator's labor)	1,834
Capital (5 percent of the average value of buildings, fences, machinery, livestock, and feed and grain of $21,332)	1,067
Total	$5,525

Rate earned on investment. See Table 14 for method of calculating.

Operator's labor and management earnings. See Table 14.

Management earnings. See Table 14.

Farm and family earnings. These consist of the total cash income less the total cash expense, plus increases in inventories, less decreases in inventories, and plus the value of farm products used in the farm home. On rented farms the earnings of both the tenant and the landlord are included in the farm and family earnings.

Method of evaluating the land. The value placed on the land on each farm was adjusted to the productive value of rented farms in Woodford county during the ten years 1936 to 1945 that had the same productivity rating of the tillable land. Woodford county is about in the center of the area in which the farms are located. The productive value of the rented farms was calculated by capitalizing the landlord's net rent from the bare land at 4 percent. Net rent consists of gross income less taxes, insurance, and other operating costs. The average values for given soil-productivity ratings are:

Soil-productivity rating of tillable land	Value per acre of bare land
1.0	$270
1.5	280
2.0	265
2.5	239
3.0	209
3.5	188
4.0	172
4.5	157
5.0	144

The value of nontillable land was adjusted from the book value that had been placed on it by the percentage adjustment made to the value of the tillable land.

The tillable land on each farm was rated from 1 to 10 according to the rating used by the Soil Survey division of the Illinois Experiment Station at the time of this study. The soils that were naturally most productive rated as 1 and the least productive soils as 10. The No. 1 soils, which are mostly level, have been cropped so heavily during the past century that they are now less productive than the good, slightly rolling soils that have not been cropped so heavily. Since this study was made, the 1 to 10 rating system was revised. The new system rates soils on the basis of 1 to 100, with 100 corresponding to the previous rating of 1.

Crop returns. This is a measure of the value of all crops produced. It is calculated by subtracting the value of crops on hand January 1 and the value of feed, seed, and grain that was bought from the sum of the values of feed and grain on hand December 31, the value of crops sold, the crops (including pasture) fed on the farm, and the crops used by the farm family. The actual value of the crops produced each year could not be calculated because the amounts and values of many miscellaneous crops were not available. "Crop returns" is about the same as "value of crops produced" when the average record of several years is obtained. It is affected each year by changing inventory values.

Crop-system rating. This rating is a measure of the immediate profitableness of the crop system, or as some say, the profitableness of the rotation. It does not place any value on fertility added or removed. All crops were rated according to the net returns per acre obtained on cost-accounting farms in Champaign and Piatt counties during the ten years 1936 to 1945. "Net returns per acre," as used here, is the difference between the total income realized from the crop, considering both grain and roughage, and the total expense of growing the crop, including taxes on the land but not including interest on the land investment or any charge for management. Ratings for different crops were:

Corn, including silage corn	100
Soybeans for grain	75
Wheat	50
Barley	40
Oats	35
Alfalfa for hay or pasture	60
Sweet clover for pasture	50
Clover and mixed clover and timothy for hay or pasture	30
All other pasture on tillable land	30
Timothy and other nonlegume hay	25
Soybean hay	0
All other crops (for the most part, canning crops such as sweet corn and peas, hemp on some farms, and grass and clover seeds)	100

No rating was given to soybean hay because the value of the crop was about equal to the cost of growing it.

The acreages of the different crops were multiplied by the above ratings and totalled and the total then divided by the total acres of tillable land to obtain the crop-system rating. The farms with the highest ratings were therefore the farms that had large acreages of corn, soybeans, wheat, and alfalfa; and the low-rating farms had large acreages of oats, timothy and clover, and bluegrass on tillable land.

Crop-yield index. The index is a measure of the yield of all grain crops on a farm, weighted according to the acreages of the different crops on that farm. In this study the index was adjusted to the productivity rating of the soil. Average yields for the ten years were:

Soil-productivity rating	Corn	Oats	Wheat	Barley	Soybeans
			(bushels per acre)		
1.5[a]	66.8	51.0	27.5	39.2	26.0
2.0	65.5	51.4	24.7	32.8	24.9
2.5	62.5	48.6	22.8	28.5	23.8
3.0	60.7	46.5	22.0	26.8	22.7
3.5	56.5	44.2	22.0	26.5	21.6
4.0	55.0	43.2	22.0	[b]	21.5
4.5	53.7	42.4	22.0	[b]	21.5
5.0	52.6	41.8	22.0	[b]	21.5

[a] No farm had all No. 1 soils. [b] No barley on these soils.

How the crop-yield index was calculated for a farm with a 2.0 soil rating is shown below.

Crop	Acres grown	Total production	Yield per acre	Average acre-yields for 2.0 soil rating	Acres required at average yield
		bu.	*bu.*	*bu.*	
Corn	100	8,500	85.0	65.5	129.8
Oats	25	1,250	50.0	51.4	24.3
Wheat	25	750	30.0	24.7	30.3
Barley	25	1,000	40.0	32.8	30.5
Soybeans	50	1,750	35.0	24.9	70.3
Totals	225	.....	....	....	285.2

285.2 (acres at average yield) ÷ 225 (acres grown) = 1.268
1.268 × 100 = 126.8, the crop-yield index

Index of livestock-production efficiency. The livestock-production index is the percentage that the total returns from all productive livestock (with returns adjusted to average prices received on all farms for livestock and livestock products) is of the total returns, calculated at the average rate of returns for each class of livestock. As an illustration, the actual total returns from productive livestock on the sample farm in Table 14 amounted to $12,531. These returns were $728 lower than average because of lower-than-average prices received for cattle, hogs, milk, and eggs. The returns were therefore adjusted by adding $728 to the actual returns, making the adjusted production returns $13,259. The total returns when figured at the average rate of returns amounted to $11,490. Since $13,259 is 115 percent of $11,490, the livestock-production index of the farm in Table 14 is 115.

Price index. The price index of a farm is the percentage that the total value of the sales of all grain, livestock, and livestock products on that farm is of what the total value would have been if all products had been sold at the average prices received by all farms. (See Table 6 for average prices received during the ten years.)

The price of cattle varies greatly with the class of cattle. When calculating the price index, the average price with which each farm's cattle price was compared was the ten-year average price of cattle from enterprises having the same percentage of cattle units represented by cows milked. These prices

were lower for herds where more milking was done. Thus where 5 percent of the cattle units were cows milked, the ten-year average price per 100 pounds was $12.20; for 10 percent, $11.65; 15 percent, $11.20; 20 percent, $10.85; 25 percent, $10.60; 30 percent, $10.40; 35 percent, $10.25; 40 percent, $10.15; 45 precent, $10.05; 50 percent, $9.45; 55 percent, $9.00; 60 percent, $8.70; and 65 percent or more, $8.50.

Percent of normal labor cost. Labor costs include hired labor, unpaid family labor, and the operator's labor used in operating the farm business. The percent of normal labor cost for a farm is the percent the labor cost of that farm is of the average labor cost on farms having the same labor requirements. Labor requirements were measured by the man-work units of work required for the crops and livestock produced. See Table 15 for illustration.

Man-work unit. This measures the amount of work the average man does in ten hours. Total man-work units on crops for a farm are calculated by multiplying the number of acres of each crop by the average hours of labor required to produce an acre of the crop and dividing the total number of hours by ten. A similar calculation is made for livestock, based on the number of units of each kind of livestock. The time required to produce different kinds of crops and livestock in Champaign and Piatt counties where cost-of-production studies were conducted during 1936 to 1945 was the basis for calculating man-work units required for the crops and livestock in the area where the farms used in this study are located.

Table 15. — Method of Calculating Percent of Normal Labor Cost, Machinery Cost, Building and Fencing Cost, and Miscellaneous Cost on a Sample Farm

Item	Sample farm
Percent of normal labor cost	
Man-work units on crops	179
Man-work units on livestock	357
Labor cost on similar farms	$2 054
Labor cost on sample farm	2 596
Percent of normal labor cost	126
Percent of normal machinery cost	
Man-work units on crops	179
Man-work units on livestock	357
Machinery cost on similar farms	$1 666
Machinery cost on sample farm	1 664
Percent of normal machinery cost	100
Percent of normal buildings and fencing cost	
Total acres in farm	480
Man-work units on livestock	357
Buildings and fencing cost on similar farms	$ 787
Buildings and fencing cost on sample farm	665
Percent of normal buildings and fencing cost	85
Percent of normal miscellaneous cost	
Total acres in farm	480
Man-work units on livestock	357
Miscellaneous costs on similar farms	$1 170
Miscellaneous costs on sample farm	880
Percent of normal miscellaneous cost	75

Percent of normal machinery cost. Machinery costs include fuel, oil, and grease, and repairs and depreciation on all machinery and equipment. The farm's share of depreciation and cost of operating the family automobile is included. The percent of normal machinery cost for a farm is the percent the machinery cost of that farm is of the average machinery cost of similar farms, that is, of farms requiring the same number of man-work units on crops and livestock (Table 15).

Percent of normal building and fencing cost. This includes repairs and depreciation on all buildings, fixed equipment, and fences. The percent for a farm is the percent the building and fencing cost on that farm is of the average cost on farms of the same size and having the same amount of livestock (Table 15).

Percent of normal miscellaneous cost. These costs consist of all operating costs not included as labor, machinery, or building and fencing costs. They include taxes, miscellaneous crop and livestock costs, and other minor miscellaneous costs. The percent for a farm is the percent that the miscellaneous costs of that farm is of the average costs on farms of the same size and having the same amount of work on productive livestock (Table 15).

NOTE ON THE STATISTICAL RESULTS

The regression of net earnings on the ten efficiency factors was calculated from the data for each of the 240 farms. The net regression coefficients are given in the text in Table 2. The standardized net regression coefficients together with their standard errors and the ratio of each regression coefficient to its standard error are shown below. "Percent of total difference in net earnings," which is the criterion of relative importance used in this report, is shown for each factor so that it may be compared with the standardized regression coefficients and the coefficients of separate determination.

	Percent of total difference in net earnings (see Table 3)	*Standardized regression coefficients*	*Standard error of standardized regression coefficients*	*Ratio of regression coefficients to their standard errors*	*Coefficients of separate determination*
Crop-yield index	27.5	.4976	.0425	11.76	.2399
Livestock-production index	11.4	.3719	.0401	9.28	.1019
Percent of normal labor cost	10.3	−.3137	.0441	−7.11	.1215
Price index	8.5	.3062	.0404	7.58	.0723
Crop-system rating	6.3	.2415	.0375	6.44	.0563
Percent of normal power and machinery cost	6.0	−.1873	.0437	−3.74	.0696
Percent of crops fed	3.0	.1349	.0401	3.36	.0349
Percent of normal building and fencing cost	2.2	−.1632	.0429	−3.80	.0314
Limestone and fertilizer costs per tillable acre	1.2	−.0567	.0381	−1.49	−.0067
Percent of normal miscellaneous costs	.2	.0446	.0412	1.08	−.0022

The probability of getting regression coefficients as large as these if the true values were zero would be less than 1 percent for all coefficients except the last two. For these the probabilities are 7 percent and 14 percent respectively. Thus the possibility is remote that any of these factors, except perhaps the measures of miscellaneous costs and limestone and fertilizer costs, are not related to earnings.

SUMMARY

A study of farm-account records of 240 similar north-central Illinois farms showed that the 72 highest-earning farms earned an average of $3,740 a farm annually more than the 72 lowest-earning farms during the ten years 1936-1945. Eight efficiency factors accounted for about three-fourths of this difference. These factors and their net effects on net farm earnings were: crop yields, accounting for 27.5 percent of the difference; livestock production efficiency, 11.4 percent; labor cost, 10.3 percent; prices received for products sold, 8.5 percent; the immediate profitableness of the crop system, 6.3 percent; power and machinery cost, 6.0 percent; percent of the value of all crops produced that was fed on the farm, 3.0 percent; and building and fencing cost, 2.2 percent.

Important relationships were found among the eight efficiency factors having appreciable effects on net farm earnings. Thus farms with high crop yields usually had large amounts of livestock and more efficient livestock production, but also had higher than average labor costs and power and machinery costs. Low labor costs were closely associated with low power and machinery costs and high labor costs with high power and machinery costs.

The rate of earnings was slightly larger on farms having a medium-sized business requiring about 24 months of man labor than on farms with smaller or larger businesses. Farms on which many hogs were produced had higher rates of earnings than farms with few hogs. This was due largely to the fact that corn-hog ratios were favorable to hog production during the ten years of the study.

Well-balanced farming, where each of the factors that have an appreciable effect on earnings was above average, led to the highest net farm earnings; three farms that were above average in all eight factors earned $3,760 a farm annually more than the average of all 240 farms included in the study. Twelve other farms below average in seven of the eight factors (none was below in all eight) earned $1,485 a farm less than the average of all farms. A farmer may do excellent work along one or two lines and still have low net farm earnings because he neglects other factors. The lowest-earning farm among all 240 farms was near the top in crop yields.

Alert farmers who study their business and apply the recommendations of the agricultural experiment stations and the practices of successful neighbors do increase their earnings.

12M—8-52—49545

UNIVERSITY OF ILLINOIS-URBANA
3 0112 018395902